

PATENT ABSTRACTS OF JAPAN

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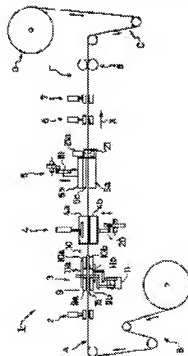
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(54) EMBOSSEMENT CARRIER TAPE MOLDING MACHINE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an embossment carrier tape molding machine wherein emboss molding is highly accurately possible by an appropriate heating without providing bad effect on a tape and molding with a uniform thickness is possible on deep draw and which exhibits excellent productivity with inexpensive installation cost.

SOLUTION: In a transferring process for transferring intermittently a sheet A by a definite transferring length, a heating part 3 with a preheating means 9, a main heating means 10 and a radiation heat insulating means 15, a molding part 4 for performing emboss molding to the sheet A on every transferring length by means of air-pressure molding and molding a plurality of pockets arranged continuously and a punch part 5 with a positioning means 21 for performing positioning of the sheet A by using a part between the packets of the embossment molding parts on the sheet A as a reference, and provided.



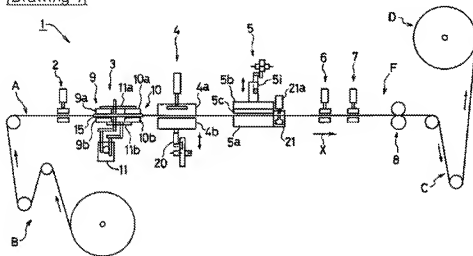
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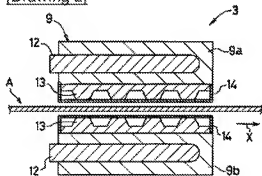
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DRAWINGS

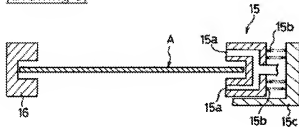
[Drawing 1]



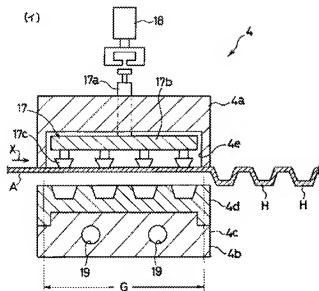
[Drawing 2]



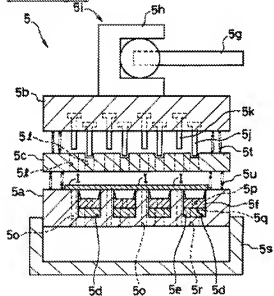
[Drawing 3]



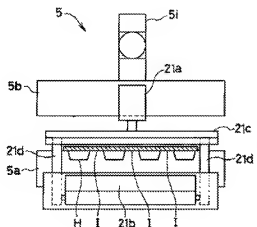
[Drawing 4]



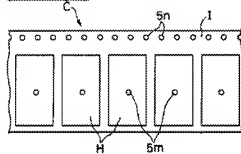
[Drawing 5]



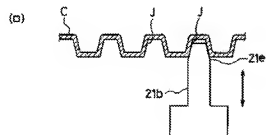
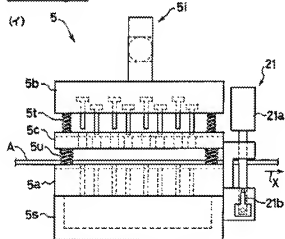
[Drawing 7]



[Drawing 8]



[Drawing 6]



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JAPANESE [JP,2000-062023,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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PRIOR ART

[Description of the Prior Art]In order that a carrier tape may supply miniature electronic components for surface mounts, such as IC, a transistor, a diode, and a capacitor, to the automatic assembling line of electronic equipment, It enables it to store a miniature electronic component a piece every to the receiving pocket in which it was provided by the long picture tape, This carrier tape that carries out storage arrangement of the same miniature electronic component as each receiving pocket is made to patrol to mounting machinery, and it enables it to perform automatic mounting which takes out said miniature electronic component in a prescribed position, and carries out a surface mount to an electronic circuit board. As a manufacturing method of this kind of carrier tape, The double-width tape made of thermoplastics is intermittently fed into a briquetting machine, it heats to a predetermined temperature by a preheating process, a receiving pocket is molded by embossing molding, a sprocket engagement hole and an ejection hole are punched, and the method of carrying out a slit to predetermined width and rolling round is taken.

[0003]By the way, in a preheating process, when the whole tape surface was heated by radiant heating with the heater from the upper and lower sides of the tape fed, there was a problem that it is bad, and thermal efficiency will need to cut both ends for the elongation by heating, etc., and led to product loss and also. If direct heating is performed for a heater in contact with the embossing object domain of the tape made of thermoplastics, the product loss which cuts both ends will be avoided. However, since a tape was quickly heated to molding required temperature for a short time and stress was added to the tape at the elevated temperature more than needed when heating was performed in one step, there was also a problem that heat contraction became large. Since the tape was fed intermittently, it had interfered with an adverse effect and precise embossing molding at the tape by the radiant heat from a heater separated and located from a tape at the time of a stop of a tape. Thus, in order to avoid the adverse effect by the radiant heat from a heater at the time of a stop of a tape, synchronizing with the stop of a tape, the mechanism in which a heater was moved to the position which the influence of radiant heat does not attain to was also considered, but there was a problem that productivity fell to the top where a mechanism is complicated.

[0004]There is compressed-air molding or vacuum molding etc. which uses the metallic mold of the press molding which uses the metallic mold of a sex couple, a concave, or a convex shape as the method of embossing molding. However, the thing which an installation cost increases since the metallic mold of a sex couple is needed in using a press die, The metallic mold of the sex was worn out by friction with the tape at the time of molding, and there was a problem of mold accuracy falling, or a crack and a crack arising in the molding side of embossing to the case of deep-drawing molding, and reducing a product yield to it especially. A set of metallic molds corresponding to variety and size also in the metallic mold of the concave or convex shape used for compressed-air molding or vacuum forming was needed, and the fall of molding die cost was demanded.

[0005]Although a sprocket engagement hole and an ejection hole are punched after embossing

molding, It is not easy to punch with sufficient accuracy about the relative position of the sprocket engagement hole and ejection hole to the position of embossing, IEC (International Electrotechnical Commission), Although it is required to have passed standards, such as EIA (Electronic Industries Association) and EIAJ (Standard of Electronic Industries Association of Japan), The accumulated error arose with progress of operation time by tape heating, the elongation of the tape by high-speed molding, etc., and the problem of stopping passing a standard was also produced.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]This invention is highly precise, and embossing molding is possible for it, without having an adverse effect on a tape with proper heating in view of the above-mentioned situation, and uniform thick molding is possible also in deep-drawing molding, and it aims at providing the embossed carrier tape briquetting machine which was excellent in productivity by cheap facility cost.

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, the embossed carrier tape briquetting machine of this invention, While providing continuously two or more pockets which carried out embossing molding of the band-like sheet which consists of thermoplastics, and were made into specified shape, carrying out punching work along with a sheet longitudinal direction, projecting at the pars basilaris ossis occipitalis of each of said pocket and providing a hole, It is a briquetting machine of the embossed carrier tape which used the fixed interval and established the sprocket engagement hole in the flange in alignment with the sequence of said pocket, In the transfer distance which carries out an intermittent transfer by a fixed quantity of transfer length, said sheet. The heated work of said sheet which carried out preheating of said sheet before embossing molding, and carried out temperature up through the preheating means which carries out temperature up, and said preheating means is carried out. The heating unit which has a radiant heat cutoff means which sprays air on the heated work means which carries out temperature up to a temperature higher than preheating, and said sheet, and intercepts the radiant heat from said both heating methods to a sheet, The molding section which molds two or more pockets which perform embossing molding by compressed-air molding for said every transfer length to the sheet transported through said heating unit, make it specified shape, respectively, and are continuously located in a line along with a sheet longitudinal direction, It had the punch part which has a positioning means which positions a sheet on the basis of pocket Mabe of the embossing molding portion in the sheet transported through said molding section. Thus, since a sheet is made into two or more steps, temperature up is carried out in an embossed carrier tape briquetting machine and he is trying to send out to a molding section, It is not necessary to carry out temperature up of the sheet for a short time to molding required temperature, generating of the stress by the side of the sheet by a rapid rise in heat is suppressed, and heat contraction is not produced. Since he is trying to intercept the propagation of the radiant heat from each heating method in a heating unit, poor heating by the propagation of radiant heat can be suppressed. In order to perform positioning of the ejection hole of a sheet, or a sprocket engagement hole to a pocket using pocket Mabe currently formed in the sheet itself of the positioning means in the punch part, When it projects with the position of a pocket and positioning of a hole or a sprocket engagement hole is set up separately, respectively, the effect excellent in practicality is done so -- the accumulated error produced with progress of operation time by tape heating, the elongation of the tape by high-speed molding, etc. can be abolished.

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MEANS

[Means for Solving the Problem]It is what was made in order to solve an aforementioned problem which provides an embossed carrier tape making machine, wherein this invention is provided with a punch part, and is characterized by that what cancels an aforementioned problem comprises the following, While providing continuously two or more pockets which carried out embossing molding of the band-like sheet which consists of thermoplastics, and were made into specified shape, carrying out punching work along with a sheet longitudinal direction, projecting at the pars basilaris ossis occipitalis of each of said pocket and providing a hole, A briquetting machine of an embossed carrier tape which used a fixed interval and established a sprocket engagement hole in a flange in alignment with a sequence of said pocket.

In transfer distance which carries out an intermittent transfer by a fixed quantity of transfer length, said sheet. The heated work of said sheet which carried out preheating of said sheet before embossing molding, and carried out temperature up through a preheating means which carries out temperature up, and said preheating means is carried out. A heating unit which has a radiant heat cutoff means which sprays air on a heated work means which carries out temperature up to a temperature higher than preheating, and said sheet, and intercepts radiant heat from said both heating methods to a sheet.

A molding section which molds two or more pockets which perform embossing molding by compressed-air molding for said every transfer length to a sheet transported through said heating unit, make it specified shape, respectively, and are continuously located in a line along with a sheet longitudinal direction.

A positioning means which positions a sheet on the basis of pocket Mabe of an embossing molding portion in a sheet transported through said molding section.

And it is good to have a cooling method which gives partial cooling to an embossing object domain in the above-mentioned molding section in this invention.

[0008]

[Embodiment of the Invention]This invention is explained in detail based on the embodiment shown in drawing 8 from drawing 1 below. Drawing 1 shows the embossed carrier tape briquetting machine 1 roughly, and this briquetting machine 1, In the transfer distance F to the coiling part D which rolls round the embossed carrier tape C after a molding process from the feed zone B which lets out the band-like sheet A which consisted of thermoplastics and was made into prescribed width. From the upstream of the transporting direction X, the upper chuck part 2, the heating unit 3, the molding section 4, the punch part 5, the downstream chuck part 6, the fixed chuck part 7, and the cutter section 8 are formed in order. It is connected in the above-mentioned briquetting machine 1 by the rod which the upper chuck part 2 and the downstream chuck part 6 are not illustrating, and the sheet A in the upper chuck part 2 puts, and Operation, the transfer operation in a fixed quantity of transfer length, and the opening motion of the sheet A, The sheet A in the downstream chuck part 6

by which embossing molding was carried out puts, are trying for operation, the transfer operation in a fixed quantity of transfer length, and the opening motion of said sheet A to synchronize, and by this upper chuck part 2 and downstream chuck part 6 that carry out synchronous operation. In transfer distance, it is made to carry out the intermittent transfer of the sheet A by a fixed quantity of transfer length, and the heating unit 3, the molding section 4, and the punch part 5 are made to perform heating operation to the sheet A, molding operation, and processing operation at the time of the stop between transfer operation.

[0009]The above-mentioned heating unit 3 is what was located in a line and formed the preheating means 9 and the heated work means 10 from the upstream of the transporting direction X, and the necessary interval is allotted among the both-hands stages 9 and 10. When the vernier circle 9a and the lower circle 9b stood face to face against the sliding direction, it can let the sheet A pass between the up-and-down board and said sheet A stops, the preheating means 9 moves from a sliding direction so that the vernier circle 9a and lower circle 9b may put said sheet A, as shown in drawing 2. Even if similarly it is in said heated work means 10, when the vernier circle 10a and the lower circle 10b can stand face to face against a sliding direction, it can let the sheet A pass in the meantime and the sheet A stops, it is provided so that the vernier circle 10a and the lower circle 10b may put the sheet A and it may move from a sliding direction. As the switching action of the up-and-down board of both these heating methods 9 and 10 is made to be performed simultaneously and it is shown in drawing 1, It is made to be taken up and down by the ascending and descending means 11 after the vernier circles 9a and 10a have been mutually connected by the support member 11a, The lower circles 9b and 10b are made to be taken up and down by said ascending and descending means 11 similarly, after having been mutually connected by the support member 11b. Said support members 11a and 11b are connected with the ascending and descending means 11 with rack-and-pinion composition, and each other is made for the group of the vernier circles 9a and 10a and the group of the lower circles 9b and 10b to operate to an opposite direction in a sliding direction. That is, the preheating means 9 and the heated work means 10 open, or are made to close by right reversal of the pinion of the ascending and descending means 11.

[0010]The composition of the preheating means 9 is shown in drawing 2, the preheating means 9 stands face to face against the sliding direction so that the vernier circle 9a and the lower circle 9b may put on both sides of the sheet A, as mentioned above -- the up-and-down boards 9a and 9b -- it is alike, respectively and the heater 12 is embedded as a heat source. The heating heights 13 which in the sheet A and the side which counters were located in a line and provided the convex body in the sheet longitudinal direction and the sheet width direction on the sheet A at each by the pattern which molds two or more pockets are arranged, the conductive heat from said heater 12 getting across to the convex body of said heating heights 13, and, It is in the position with which the convex body in the heating heights 13 of a way and the convex body of the downward heating heights 13 besides lap in a sliding direction, Each convex body of the up-and-down heating heights 13 contacts the sheet A, and is made to carry out heating temperature up of the position which should be heated by putting the sheet A by the vernier circle 9a and the lower circle 9b to it selectively, respectively. Said heating heights 13 are covered with the cover sheet 14 which consists of a Teflon sheet, and the sheet A is kept from sticking them to the up-and-down boards 9a and 9b. Although the preheating means 9 is shown in drawing 2, the heated work means 10 also has the same composition.

[0011]As mentioned above, in the heating unit 3, it has two heating methods of the preheating means 9 and the heated work means 10. And in the preheating means 9, carry out preheating of the sheet A, and temperature up is carried out to prescribed temperature, It is provided so that temperature up may be carried out to the prescribed temperature which made the sheet A by which temperature up was carried out by this preheating means 9 a temperature higher than the

prescribed temperature in said preheating means 9 by the heated work means 10, The sheet A is made into two steps, and he carries out temperature up, and is trying to become preset temperature until it can perform embossing molding by the below-mentioned molding section. Thus, in the heating unit 3, in order to carry out temperature up only of the necessary part of the sheet A, holding in the state of pinching, heat contraction in the cross direction of the sheet A is made into the minimum. This point and the conventional heating method perform indirect hot wind heating to the whole sheet surface, or are irradiating with far-infrared rays, a sheet will need to carry out heat contraction of them crosswise, they need to cut both ends in post processing, and have become what has a large loss to product width. In the former, in order to carry out temperature up of the sheet for a short time, give stress to a sheet at the elevated temperature more than needed, and heat contraction is large, but. As mentioned above, by this heating unit 3, since temperature up is carried out gradually, the sheet by which the temperature control of the sheet to prescribed temperature becomes easy, there is no stress, and temperature up was carried out properly can be sent out to the molding section side.

[0012] Furthermore, the radiant heat cutoff means 15 is formed in the above-mentioned heating unit 3. From the above-mentioned preheating means 9, this radiant heat cutoff means 15 covers the downstream a little from the above-mentioned heated work means 10 from the upstream, and as it meets one side of the sheet A, it is arranged. While this radiant heat cutoff means 15 is established in the shape of [which used the sheet A side as the opening portion in the sectional shape in the direction which intersects perpendicularly with a sheet transporting direction] approximately KO type as shown in drawing 3, that inside -- the upper and lower sides -- it has the air duct 15a which separated to two forks, and this air duct 15a is arranged at the longitudinal direction of this radiant heat cutoff means 15. The air set as prescribed temperature in the radiant heat cutoff means 15 from the supply source which is not illustrated to the air duct 15a is sent in, Compressed air is made to blow off from the air duct 15a along with the upper surface side of the sheet A, and the undersurface side, Blow off of the compressed air is performed at the time of a device (operation) halt, an air curtain is formed between the preheating means 9 and the heated work means 10 in a position in readiness, and the sheet A, and the radiant heat which comes out of the preheating means 9 in a position in readiness and the heated work means 10 is kept from getting across to the sheet A side. This radiant heat cutoff means 15 is supported by the supporter 15c via the spring 15b as shown in drawing 3. The reference-guides object 16 considered as position immobilization by the shape of approximately KO type to which it is located along the side of another side of the sheet A, and sectional shape (sectional shape in the method of intersecting perpendicularly with the sheet transporting direction X) uses the sheet A side as an opening portion is faced. And it is what is guided so that the sheet A may pass along between said reference-guides object 16 and this radiant heat cutoff means 15, Positioning in the cross direction of the sheet A is performed so that it may be transported holding down Bure at the time of a transfer of the sheet A by said spring 15b, and showing around at the reference-guides object 16.

[0013] As the molding section 4 performs embossing molding by compressed-air molding for said every transfer length to the sheet A transported through the above-mentioned heating unit 3 and it is shown in drawing 4, It consists of a Shimokane type 4b formed so that vertical movement was possible, and the upper mold 4a and the sheet A which have been arranged in the undersurface part as touched the sheet A could be put. and the core which attached the top molding metal mold 4d of the base 4c if it was in said Shimokane type 4b -- it being considered as the method, the mold clamp of the upper mold 4a and the Shimokane type 4b being carried out, and, when embossing molding is carried out, The compressed air sent into the cavity 4e of the upper mold 4a presses down the sheet A to said molding metal mold 4d, and it with this molding metal mold 4d. Two or more pockets which use specified shape to the sheet A of a fixed quantity of transfer length in an intermittent transfer, respectively, and are continuously located in a line along a sheet longitudinal

direction and the cross direction are made to be molded. Thus, in the molding section 4, when the Shimokane type 4b is divided into the base 4c and the molding metal mold 4d and shape, a pitch, etc. of a pocket which carry out embossing molding are changed, it shall enable it to cope with it by exchanging only this molding metal mold 4d, and it is not necessary to exchange the whole Shimokane type 4b. Embossing molding to the sheet A in the above-mentioned molding section 4 is performed on every [of transfer length G sent in] sheet A, and the pitch of the pocket molded also by the portion with which sheet A of transfer length G by which embossing molding was carried out is connected is kept from changing.

[0014]In this molding section 4, the cooling method 17 arranged so that it may correspond to the tie-down plate 17b connected with the stay 17a which penetrated the upper mold 4a at the pocket which carries out embossing molding of two or more contact bodies 17c is formed in the cavity 4e of the above-mentioned upper mold 4a. This cooling method 17 is what was made to perform partial cooling by contact to the embossing object domain of the sheet A of 1 transfer length G sent into the molding section 4, While making the lower end of said contact body 17c a little smaller than the pars-basilaris-ossis-occipitalis shape of each mold part in the molding metal mold 4d, By considering it as a temperature state lower than the temperature of the sheet A by which temperature up was carried out by the heating unit 3, and contacting this to the embossing object domain of the sheet A. The temperature of the portion which will enter into the pars-basilaris-ossis-occipitalis side of each mold part of said molding metal mold 4d at the time of embossing molding is lowered, and the thickness of the bottom of the pocket H by which embossing molding was carried out is kept from becoming thin as shown in drawing 4 (**). And in carrying out embossing molding of the pocket (pocket which has a depth of not less than 5 mm) of deep drawing in this molding section 4. A pocket is molded connecting the stay 17a of the above-mentioned cooling method 17 with the cylinder device 18 currently illustrated, dropping the cooling method 17 in operation of this cylinder device 18 with the supplied air of compressed air, and contacting the contact body 17c on a sheet. Thus, it can stop that the thickness of the bottom of a pocket becomes small also in the case of deep drawing because you make it accompanied by descent of the cooling method 17. Thus, since the thickness of the pars basilaris ossis occipitalis of a pocket is kept from becoming thin in the case of which, the intensity as a package which stores a miniature electronic component can be maintained. In drawing 4, 19 shows the passage of cooling water. The cam mechanism object which you make it go up and down while 20 responds the Shimokane type 4b to the timing of an intermittent transfer of the sheet A in drawing 1 is shown.

[0015]Drawing 5 shows the rough section which met the above-mentioned punch part 5 crosswise [of the sheet A], and drawing 6 shows the rough section which similarly met the transporting direction X of the sheet A in the punch part 5. Drawing 8 shows the flat surface of the embossed carrier tape C produced by embossing-molding and carrying out punching work. As shown in said drawing 5 the punch part 5, It consists of the strip artist 5c stationed between the cradle 5a which supports the sheet A which has been transported from the molding section 4, and which has been embossing molded from a lower part, the punch covering 5b the placed opposite of the vertical movement of was made possible to the upper part of this cradle 5a, and said cradle 5a and the punch covering 5b. And it has 5 d of concaves corresponding to the sequence of the pocket H so that the sheet A which has been transported from the molding section 4 and which has been embossing molded can be supported to a transporting direction with a movable state, if it is in said cradle 5a, 5d of the concave is carrying out insertion arrangement of the die plate 5f to each on it with the dice pacer 5e. It is what is taken up and down by operation of 5 g of said shaking bodies in a sliding direction via the cam mechanism object 5i which the cam object 5h stops to 5 g of shaking bodies which carry out rotational operation to a sliding direction in the range of predetermined angle of rotation on the other hand if it is in the punch covering 5b, And to the undersurface side of this punch covering 5b. The side pin 5k for opening the sprocket engagement hole arranged with a

prescribed interval in flange I located in accordance with the center pin 5j for projecting at the pars basilaris ossis occipitalis of said pocket H, and opening a hole and each sequence of the pocket H projects, and is arranged, When it is in the state where the sheet A embossing molded into said cradle 5a stopped, and the below-mentioned positioning was performed, Said punch covering 5b descends and the center pin 5j and the side pin 5k fall through 5l of each bore by which the opening is carried out to said strip artist 5c, If it is in said center pin 5j, project at the pars basilaris ossis occipitalis of the pocket H, open 5 m (refer to [drawing 8](#)) of holes, and it passes along the die plate 5f, If it is in the side pin 5k, he is trying to go into the bore 5o for side-pin acceptance by which opened 5 n (refer to [drawing 8](#)) of sprocket engagement holes in flange I, and the opening was carried out to the cradle 5a side. The dregs produced in the opening of 5 m of ejection holes by the center pin 5j, It falls caudad through the bore 5p of the die plate 5f, the bore 5q provided in the dice pacer 5e, and the bore 5r in the cradle 5a of the lower part, The dregs produced in the opening of 5 n of sprocket engagement holes by the side pin 5k fall through said bore 5o for side-pin acceptance of the cradle 5a, and are made to be caught with 5 s of downward dregs receptacles. Said strip artist 5c regulates the amount of descent of each pin while putting and holding the sheet A by the cradle 5a. And while the first spring 5t is arranged between this strip artist 5c and the punch covering 5b, Between the strip artist 5c and the cradle 5a, the second spring 5u with small compression stress is arranged from the first spring 5t, When the punch covering 5b descends, the strip artist 5c descends, an insert lump of the sheet A is performed previously, and make and project and the opening of 5 m of holes and 5 n of sprocket engagement holes is performed, The sheet A puts by this strip artist 5c and cradle 5a, a state is maintained until each pin falls out from the sheet A upwards, when the punch covering 5b goes up, and as the strip artist 5c separates from the cradle 5a, the sheet A is kept from accompanying to each pin after that.

[0016]In the punch part 5, the lock body 21b was taken up and down with the cylinder device 21a, and it has the positioning means 21 it was made to make the sheet A stop the lock body 21b as shown in [drawing 6](#). This positioning means 21 is located in the downstream of the punch part 5, and is attached to the cradle 5a of the above-mentioned position immobilization, The stay 21d comes down on both sides of the sheet A from the horizontal plate 21c attached to the cylinder device 21a as shown in [drawing 7](#), and he is trying to support said lock body 21b by the stay 21d of this couple. And if it is in said lock body 21b, when it is a standing board-like thing covering the cross direction of the sheet A and this lock body 21b goes up, The upper bed 21e fits into pocket Mabe J by whom two or more pockets H are formed in the pocket projection side along with a sheet longitudinal direction, and it positions so that the position of the pocket H by which embossing molding was carried out may become the sheet A with an appropriate position to each above-mentioned pins 5j and 5k. Especially the upper bed 21e of said lock body 21b supports the undersurface side sectional shape along pocket Mabe's J sheet transporting direction, It is provided so that sectional shape in the sheet transporting direction of the upper bed 21e may be made into a tapered form if it is in the illustrated example, and the upper bed 21e may not contact a sheet general part (portions other than a pocket). Thus, it is positioning by making the lock body 21b of the above-mentioned positioning means 21 fit in between the pockets H, and it projects to the appropriate position to the pocket H with simple composition, and enables it to open a hole and a sprocket engagement hole in the punch part 5.

[0017]If the above-mentioned fixed chuck part 7 holds the sheet A at the time of the stop of an intermittent transfer and is in the cutter section 8, This sheet A is cut for every sequence of the pocket H, the embossed carrier tape C is obtained by passing through this cutter section 8, and this embossed carrier tape C is rolled round by the rolling-up part D.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is an explanatory view showing roughly an example of the embossed carrier tape briquetting machine concerning this invention.

[Drawing 2] It is an explanatory view showing the preheating means of the heating unit in an example.

[Drawing 3] It is an explanatory view showing the radiant heat cutoff means in a heating unit similarly.

[Drawing 4] The explanatory view in which embossing molding is shown and (b) shows a molding section, and (**) are the explanatory views showing a pocket in a section.

[Drawing 5] It is an explanatory view showing a punch part in the section along a sheet width direction.

[Drawing 6] The explanatory view in which a punch part and a positioning means are shown and (b) shows a punch part on the side along a sheet transporting direction, and (**) are the explanatory views showing the lock body of a positioning means, and pocket Mabe's engagement state.

[Drawing 7] It is an explanatory view shown where a positioning means is seen from the sheet transporting direction side.

[Drawing 8] It is an explanatory view showing an embossed carrier tape.

[Description of Notations]

1 -- Embossed carrier tape briquetting machine

A -- Sheet

C -- Carrier tape

D -- Coiling part

F -- Transfer distance

G -- Transfer length

H -- Pocket

I -- Flange

J -- Pocket Mabe

3 -- Heating unit

4 -- Molding section

5 -- Punch part

8 -- Cutter section

9 -- Preheating means

10 -- Heated work means

15 -- Radiant heat cutoff means

17 -- Cooling method

18 -- Cylinder device

21 -- Positioning means

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the briquetting machine of the embossed carrier tape which provided continuously the pocket which stores a miniature electronic component etc. in the direction of a tape length hand by embossing molding.

[0002]

[Description of the Prior Art] In order that a carrier tape may supply miniature electronic components for surface mounts, such as IC, a transistor, a diode, and a capacitor, to the automatic assembling line of electronic equipment, it enables it to store a miniature electronic component a piece every to the receiving pocket in which it was provided by the long picture tape. This carrier tape that carries out storage arrangement of the same miniature electronic component as each receiving pocket is made to patrol to mounting machinery, and it enables it to perform automatic mounting which takes out said miniature electronic component in a prescribed position, and carries out a surface mount to an electronic circuit board. As a manufacturing method of this kind of carrier tape, The double-width tape made of thermoplastics is intermittently fed into a briquetting machine, it heats to a predetermined temperature by a preheating process, a receiving pocket is molded by embossing molding, a sprocket engagement hole and an ejection hole are punched, and the method of carrying out a slit to predetermined width and rolling round is taken.

[0003] By the way, in a preheating process, when the whole tape surface was heated by radiant heating with the heater from the upper and lower sides of the tape fed, there was a problem that it is bad, and thermal efficiency will need to cut both ends for the elongation by heating, etc., and led to product loss and also. If direct heating is performed for a heater in contact with the embossing object domain of the tape made of thermoplastics, the product loss which cuts both ends will be avoided. However, since a tape was quickly heated to molding required temperature for a short time and stress was added to the tape at the elevated temperature more than needed when heating was performed in one step, there was also a problem that heat contraction became large. Since the tape was fed intermittently, it had interfered with an adverse effect and precise embossing molding at the tape by the radiant heat from a heater separated and located from a tape at the time of a stop of a tape. Thus, in order to avoid the adverse effect by the radiant heat from a heater at the time of a stop of a tape, synchronizing with the stop of a tape, the mechanism in which a heater was moved to the position which the influence of radiant heat does not attain to was also considered, but there was a problem that productivity fell to the top where a mechanism is complicated.

[0004] There is compressed-air molding or vacuum molding etc. which uses the metallic mold of the press molding which uses the metallic mold of a sex couple, a concave, or a convex shape as the method of embossing molding. However, the thing which an installation cost increases since the metallic mold of a sex couple is needed in using a press die, The metallic mold of the sex was

worn out by friction with the tape at the time of molding, and there was a problem of mold accuracy falling, or a crack and a crack arising in the molding side of embossing to the case of deep-drawing molding, and reducing a product yield to it especially. A set of metallic molds corresponding to variety and size also in the metallic mold of the concave or convex shape used for compressed-air molding or vacuum forming was needed, and the fall of molding die cost was demanded.

[0005] Although a sprocket engagement hole and an ejection hole are punched after embossing molding, it is not easy to punch with sufficient accuracy about the relative position of the sprocket engagement hole and ejection hole to the position of embossing, IEC (International Electrotechnical Commission), Although it is required to have passed standards, such as EIA (Electronic Industries Association) and EIAJ (Standard of Electronic Industries Association of Japan), The accumulated error arose with progress of operation time by tape heating, the elongation of the tape by high-speed molding, etc., and the problem of stopping passing a standard was also produced.

[0006]

[Problem(s) to be Solved by the Invention] This invention is highly precise, and embossing molding is possible for it, without having an adverse effect on a tape with proper heating in view of the above-mentioned situation, and uniform thick molding is possible also in deep-drawing molding, and it aims at providing the embossed carrier tape briquetting machine which was excellent in productivity by cheap facility cost.

[0007]

[Means for Solving the Problem] It is what was made in order to solve an aforementioned problem which provides an embossed carrier tape making machine, wherein this invention is provided with a punch part, and is characterized by that what cancels an aforementioned problem comprises the following, While providing continuously two or more pockets which carried out embossing molding of the band-like sheet which consists of thermoplastics, and were made into specified shape, carrying out punching work along with a sheet longitudinal direction, projecting at the pars basilaris ossis occipitalis of each of said pocket and providing a hole, A briquetting machine of an embossed carrier tape which used a fixed interval and established a sprocket engagement hole in a flange in alignment with a sequence of said pocket.

In transfer distance which carries out an intermittent transfer by a fixed quantity of transfer length, said sheet. The heated work of said sheet which carried out preheating of said sheet before embossing molding, and carried out temperature up through a preheating means which carries out temperature up, and said preheating means is carried out. A heating unit which has a radiant heat cutoff means which sprays air on a heated work means which carries out temperature up to a temperature higher than preheating, and said sheet, and intercepts radiant heat from said both heating methods to a sheet.

A molding section which molds two or more pockets which perform embossing molding by compressed-air molding for said every transfer length to a sheet transported through said heating unit, make it specified shape, respectively, and are continuously located in a line along with a sheet longitudinal direction.

A positioning means which positions a sheet on the basis of pocket Mabe of an embossing molding portion in a sheet transported through said molding section.

And it is good to have a cooling method which gives partial cooling to an embossing object domain in the above-mentioned molding section in this invention.

[0008]

[Embodiment of the Invention] This invention is explained in detail based on the embodiment shown in drawing 8 from drawing 1 below. Drawing 1 shows the embossed carrier tape briquetting machine 1 roughly, and this briquetting machine 1, In the transfer distance F to the coiling part D which rolls round the embossed carrier tape C after a molding process from the feed zone B which

lets out the band-like sheet A which consisted of thermoplastics and was made into prescribed width. From the upstream of the transporting direction X, the upper chuck part 2, the heating unit 3, the molding section 4, the punch part 5, the downstream chuck part 6, the fixed chuck part 7, and the cutter section 8 are formed in order. It is connected in the above-mentioned briquetting machine 1 by the rod which the upper chuck part 2 and the downstream chuck part 6 are not illustrating, and the sheet A in the upper chuck part 2 puts, and Operation, the transfer operation in a fixed quantity of transfer length, and the opening motion of the sheet A, The sheet A in the downstream chuck part 6 by which embossing molding was carried out puts, are trying for operation, the transfer operation in a fixed quantity of transfer length, and the opening motion of said sheet A to synchronize, and by this upper chuck part 2 and downstream chuck part 6 that carry out synchronous operation. In transfer distance, it is made to carry out the intermittent transfer of the sheet A by a fixed quantity of transfer length, and the heating unit 3, the molding section 4, and the punch part 5 are made to perform heating operation to the sheet A, molding operation, and processing operation at the time of the step between transfer operation.

[0009]The above-mentioned heating unit 3 is what was located in a line and formed the preheating means 9 and the heated work means 10 from the upstream of the transporting direction X, and the necessary interval is allotted among the both-hands stages 9 and 10. When the vernier circle 9a and the lower circle 9b stood face to face against the sliding direction, it can let the sheet A pass between the up-and-down board and said sheet A stops, the preheating means 9 moves from a sliding direction so that the vernier circle 9a and lower circle 9b may put said sheet A, as shown in drawing 2. Even if similarly it is in said heated work means 10, when the vernier circle 10a and the lower circle 10b can stand face to face against a sliding direction, it can let the sheet A pass in the meantime and the sheet A stops, it is provided so that the vernier circle 10a and the lower circle 10b may put the sheet A and it may move from a sliding direction. As the switching action of the up-and-down board of both these heating methods 9 and 10 is made to be performed simultaneously and it is shown in drawing 1, It is made to be taken up and down by the ascending and descending means 11 after the vernier circles 9a and 10a have been mutually connected by the support member 11a, The lower circles 9b and 10b are made to be taken up and down by said ascending and descending means 11 similarly, after having been mutually connected by the support member 11b. Said support members 11a and 11b are connected with the ascending and descending means 11 with rack-and-pinion composition, and each other is made for the group of the vernier circles 9a and 10a and the group of the lower circles 9b and 10b to operate to an opposite direction in a sliding direction. That is, the preheating means 9 and the heated work means 10 open, or are made to close by right reversal of the pinion of the ascending and descending means 11.

[0010]The composition of the preheating means 9 is shown in drawing 2, the preheating means 9 stands face to face against the sliding direction so that the vernier circle 9a and the lower circle 9b may put on both sides of the sheet A, as mentioned above -- the up-and-down boards 9a and 9b -- it is alike, respectively and the heater 12 is embedded as a heat source. The heating heights 13 which in the sheet A and the side which counters were located in a line and provided the convex body in the sheet longitudinal direction and the sheet width direction on the sheet A at each by the pattern which molds two or more pockets are arranged, the conductive heat from said heater 12 getting across to the convex body of said heating heights 13, and, It is in the position with which the convex body in the heating heights 13 of a way and the convex body of the downward heating heights 13 besides lap in a sliding direction, Each convex body of the up-and-down heating heights 13 contacts the sheet A, and is made to carry out heating temperature up of the position which should be heated by putting the sheet A by the vernier circle 9a and the lower circle 9b to it selectively, respectively. Said heating heights 13 are covered with the cover sheet 14 which consists of a Teflon sheet, and the sheet A is kept from sticking them to the up-and-down boards 9a

and 9b. Although the preheating means 9 is shown in drawing 2, the heated work means 10 also has the same composition.

[0011]As mentioned above, in the heating unit 3, it has two heating methods of the preheating means 9 and the heated work means 10. And in the preheating means 9, carry out preheating of the sheet A, and temperature up is carried out to prescribed temperature, It is provided so that temperature up may be carried out to the prescribed temperature which made the sheet A by which temperature up was carried out by this preheating means 9 a temperature higher than the prescribed temperature in said preheating means 9 by the heated work means 10, The sheet A is made into two steps, and he carries out temperature up, and is trying to become preset temperature until it can perform embossing molding by the below-mentioned molding section. Thus, in the heating unit 3, in order to carry out temperature up only of the necessary part of the sheet A, holding in the state of pinching, heat contraction in the cross direction of the sheet A is made into the minimum. This point and the conventional heating method perform indirect hot wind heating to the whole sheet surface, or are irradiating with far-infrared rays, a sheet will need to carry out heat contraction of them crosswise, they need to cut both ends in post processing, and have become what has a large loss to product width. In the former, in order to carry out temperature up of the sheet for a short time, give stress to a sheet at the elevated temperature more than needed, and heat contraction is large, but. As mentioned above, by this heating unit 3, since temperature up is carried out gradually, the sheet by which the temperature control of the sheet to prescribed temperature becomes easy, there is no stress, and temperature up was carried out properly can be sent out to the molding section side.

[0012]Furthermore, the radiant heat cutoff means 15 is formed in the above-mentioned heating unit 3. From the above-mentioned preheating means 9, this radiant heat cutoff means 15 covers the downstream a little from the above-mentioned heated work means 10 from the upstream, and as it meets one side of the sheet A, it is arranged. While this radiant heat cutoff means 15 is established in the shape of [which used the sheet A side as the opening portion in the sectional shape in the direction which intersects perpendicularly with a sheet transporting direction] approximately KO type as shown in drawing 3, that inside -- the upper and lower sides -- it has the air duct 15a which separated to two forks, and this air duct 15a is arranged at the longitudinal direction of this radiant heat cutoff means 15. The air set as prescribed temperature in the radiant heat cutoff means 15 from the supply source which is not illustrated to the air duct 15a is sent in, Compressed air is made to blow off from the air duct 15a along with the upper surface side of the sheet A, and the undersurface side, Blow off of the compressed air is performed at the time of a device (operation) halt, an air curtain is formed between the preheating means 9 and the heated work means 10 in a position in readiness, and the sheet A, and the radiant heat which comes out of the preheating means 9 in a position in readiness and the heated work means 10 is kept from getting across to the sheet A side. This radiant heat cutoff means 15 is supported by the supporter 15c via the spring 15b as shown in drawing 3. The reference-guides object 16 considered as position immobilization by the shape of approximately KO type to which it is located along the side of another side of the sheet A, and sectional shape (sectional shape in the method of intersecting perpendicularly with the sheet transporting direction X) uses the sheet A side as an opening portion is faced. And it is what is guided so that the sheet A may pass along between said reference-guides object 16 and this radiant heat cutoff means 15. Positioning in the cross direction of the sheet A is performed so that it may be transported holding down Bure at the time of a transfer of the sheet A by said spring 15b, and showing around at the reference-guides object 16.

[0013]As the molding section 4 performs embossing molding by compressed-air molding for said every transfer length to the sheet A transported through the above-mentioned heating unit 3 and it is shown in drawing 4, It consists of a Shimokane type 4b formed so that vertical movement was possible, and the upper mold 4a and the sheet A which have been arranged in the undersurface

part as touched the sheet A could be put, and the core which attached the top molding metal mold 4d of the base 4c if it was in said Shimokane type 4b -- it being considered as the method, the mold clamp of the upper mold 4a and the Shimokane type 4b being carried out, and, when embossing molding is carried out, The compressed air sent into the cavity 4e of the upper mold 4a presses down the sheet A to said molding metal mold 4d, and it with this molding metal mold 4d. Two or more pockets which use specified shape to the sheet A of a fixed quantity of transfer length in an intermittent transfer, respectively, and are continuously located in a line along a sheet longitudinal direction and the cross direction are made to be molded. Thus, in the molding section 4, when the Shimokane type 4b is divided into the base 4c and the molding metal mold 4d and shape, a pitch, etc. of a pocket which carry out embossing molding are changed, it shall enable it to cope with it by exchanging only this molding metal mold 4d, and it is not necessary to exchange the whole Shimokane type 4b. Embossing molding to the sheet A in the above-mentioned molding section 4 is performed on every [of transfer length G sent in] sheet A, and the pitch of the pocket molded also by the portion with which sheet A of transfer length G by which embossing molding was carried out is connected is kept from changing.

[0014] In this molding section 4, the cooling method 17 arranged so that it may correspond to the tie-down plate 17b connected with the stay 17a which penetrated the upper mold 4a at the pocket which carries out embossing molding of two or more contact bodies 17c is formed in the cavity 4e of the above-mentioned upper mold 4a. This cooling method 17 is what was made to perform partial cooling by contact to the embossing object domain of the sheet A of 1 transfer length G sent into the molding section 4. While making the lower end of said contact body 17c a little smaller than the pars-basilaris-ossis-occipitalis shape of each mold part in the molding metal mold 4d. By considering it as a temperature state lower than the temperature of the sheet A by which temperature up was carried out by the heating unit 3, and contacting this to the embossing object domain of the sheet A. The temperature of the portion which will enter into the pars-basilaris-ossis-occipitalis side of each mold part of said molding metal mold 4d at the time of embossing molding is lowered, and the thickness of the bottom of the pocket H by which embossing molding was carried out is kept from becoming thin as shown in drawing 4 (**). And in carrying out embossing molding of the pocket (pocket which has a depth of not less than 5 mm) of deep drawing in this molding section 4. A pocket is molded connecting the stay 17a of the above-mentioned cooling method 17 with the cylinder device 18 currently illustrated, dropping the cooling method 17 in operation of this cylinder device 18 with the supplied air of compressed air, and contacting the contact body 17c on a sheet. Thus, it can stop that the thickness of the bottom of a pocket becomes small also in the case of deep drawing because you make it accompanied by descent of the cooling method 17. Thus, since the thickness of the pars basilaris ossis occipitalis of a pocket is kept from becoming thin in the case of which, the intensity as a package which stores a miniature electronic component can be maintained. In drawing 4, 19 shows the passage of cooling water. The cam mechanism object which you make it go up and down while 20 responds the Shimokane type 4b to the timing of an intermittent transfer of the sheet A in drawing 1 is shown.

[0015] Drawing 5 shows the rough section which met the above-mentioned punch part 5 crosswise [of the sheet A], and drawing 6 shows the rough section which similarly met the transporting direction X of the sheet A in the punch part 5. Drawing 8 shows the flat surface of the embossed carrier tape C produced by embossing-molding and carrying out punching work. As shown in said drawing 5 the punch part 5, It consists of the strip artist 5c stationed between the cradle 5a which supports the sheet A which has been transported from the molding section 4, and which has been embossing molded from a lower part, the punch covering 5b the placed opposite of the vertical movement of was made possible to the upper part of this cradle 5a, and said cradle 5a and the punch covering 5b. And it has 5 d of concaves corresponding to the sequence of the pocket H so that the sheet A which has been transported from the molding section 4 and which has been

embossing molded can be supported to a transporting direction with a movable state, if it is in said cradle 5a, 5d of the concave is carrying out insertion arrangement of the die plate 5f to each on it with the dice pacer 5e. It is what is taken up and down by operation of 5 g of said shaking bodies in a sliding direction via the cam mechanism object 5i which the cam object 5h stops to 5 g of shaking bodies which carry out rotational operation to a sliding direction in the range of predetermined angle of rotation on the other hand if it is in the punch covering 5b, And to the undersurface side of this punch covering 5b. The side pin 5k for opening the sprocket engagement hole arranged with a prescribed interval in flange l located in accordance with the center pin 5j for projecting at the pars basilaris ossis occipitalis of said pocket H, and opening a hole and each sequence of the pocket H projects, and is arranged, When it is in the state where the sheet A embossing molded into said cradle 5a stopped, and the below-mentioned positioning was performed, Said punch covering 5b descends and the center pin 5j and the side pin 5k fall through 5 l. of each bore by which the opening is carried out to said strip artist 5c, If it is in said center pin 5j, project at the pars basilaris ossis occipitalis of the pocket H, open 5 m (refer to drawing 8) of holes, and it passes along the die plate 5f, If it is in the side pin 5k, he is trying to go into the bore 5o for side-pin acceptance by which opened 5 n (refer to drawing 8) of sprocket engagement holes in flange l, and the opening was carried out to the cradle 5a side. The dregs produced in the opening of 5 m of ejection holes by the center pin 5j, It falls caudad through the bore 5p of the die plate 5f, the bore 5q provided in the dice pacer 5e, and the bore 5r in the cradle 5a of the lower part, The dregs produced in the opening of 5 n of sprocket engagement holes by the side pin 5k fall through said bore 5o for side-pin acceptance of the cradle 5a, and are made to be caught with 5 s of downward dregs receptacles. Said strip artist 5c regulates the amount of descent of each pin while putting and holding the sheet A by the cradle 5a. And while the first spring 5t is arranged between this strip artist 5c and the punch covering 5b, Between the strip artist 5c and the cradle 5a, the second spring 5u with small compression stress is arranged from the first spring 5t, When the punch covering 5b descends, the strip artist 5c descends, an insert lump of the sheet A is performed previously, and make and project and the opening of 5 m of holes and 5 n of sprocket engagement holes is performed, The sheet A puts by this strip artist 5c and cradle 5a, a state is maintained until each pin falls out from the sheet A upwards, when the punch covering 5b goes up, and as the strip artist 5c separates from the cradle 5a, the sheet A is kept from accompanying to each pin after that.

[0016]In the punch part 5, the lock body 21b was taken up and down with the cylinder device 21a, and it has the positioning means 21 it was made to make the sheet A stop the lock body 21b as shown in drawing 6. This positioning means 21 is located in the downstream of the punch part 5, and is attached to the cradle 5a of the above-mentioned position immobilization, The stay 21d comes down on both sides of the sheet A from the horizontal plate 21c attached to the cylinder device 21a as shown in drawing 7, and he is trying to support said lock body 21b by the stay 21d of this couple. And if it is in said lock body 21b, when it is a standing board-like thing covering the cross direction of the sheet A and this lock body 21b goes up, The upper bed 21e fits into pocket Mabe J by whom two or more pockets H are formed in the pocket projection side along with a sheet longitudinal direction, and it positions so that the position of the pocket H by which embossing molding was carried out may become the sheet A with an appropriate position to each above-mentioned pins 5j and 5k. Especially the upper bed 21e of said lock body 21b supports the undersurface side sectional shape along pocket Mabe's J sheet transporting direction. It is provided so that sectional shape in the sheet transporting direction of the upper bed 21e may be made into a tapered form if it is in the illustrated example, and the upper bed 21e may not contact a sheet general part (portions other than a pocket). Thus, it is positioning by making the lock body 21b of the above-mentioned positioning means 21 fit in between the pockets H, and it projects to the appropriate position to the pocket H with simple composition, and enables it to open a hole and a sprocket engagement hole in the punch part 5.

[0017] If the above-mentioned fixed chuck part 7 holds the sheet A at the time of the stop of an intermittent transfer and is in the cutter section 8, This sheet A is cut for every sequence of the pocket H, the embossed carrier tape C is obtained by passing through this cutter section 8, and this embossed carrier tape C is rolled round by the rolling-up part D.

[0018]

[Effect of the Invention] As explained above, the embossed carrier tape briquetting machine of this invention, While providing continuously two or more pockets which carried out embossing molding of the band-like sheet which consists of thermoplastics, and were made into specified shape, carrying out punching work along with a sheet longitudinal direction, projecting at the pars basilaris ossis occipitalis of each of said pocket and providing a hole, It is a briquetting machine of the embossed carrier tape which used the fixed interval and established the sprocket engagement hole in the flange in alignment with the sequence of said pocket, In the transfer distance which carries out an intermittent transfer by a fixed quantity of transfer length, said sheet. The heated work of said sheet which carried out preheating of said sheet before embossing molding, and carried out temperature up through the preheating means which carries out temperature up, and said preheating means is carried out. The heating unit which has a radiant heat cutoff means which sprays air on the heated work means which carries out temperature up to a temperature higher than preheating, and said sheet, and intercepts the radiant heat from said both heating methods to a sheet, The molding section which molds two or more pockets which perform embossing molding by compressed-air molding for said every transfer length to the sheet transported through said heating unit, make it specified shape, respectively, and are continuously located in a line along with a sheet longitudinal direction, It had the punch part which has a positioning means which positions a sheet on the basis of pocket Mabe of the embossing molding portion in the sheet transported through said molding section. Thus, since a sheet is made into two or more steps, temperature up is carried out in an embossed carrier tape briquetting machine and he is trying to send out to a molding section, It is not necessary to carry out temperature up of the sheet for a short time to molding required temperature, generating of the stress by the side of the sheet by a rapid rise in heat is suppressed, and heat contraction is not produced. Since he is trying to intercept the propagation of radiant heat from each heating method in a heating unit, poor heating by the propagation of radiant heat can be suppressed. In order to perform positioning of the ejection hole of a sheet, or a sprocket engagement hole to a pocket using pocket Mabe currently formed in the sheet itself of the positioning means in the punch part, When it projects with the position of a pocket and positioning of a hole or a sprocket engagement hole is set up separately, respectively, the effect excellent in practicality is done so -- the accumulated error produced with progress of operation time by tape heating, the elongation of the tape by high-speed molding, etc. can be abolished.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1]Two or more pockets which carried out embossing molding of the band-like sheet characterized by comprising the following which consists of thermoplastics, and were made into specified shape are continuously provided along with a sheet longitudinal direction, A briquetting machine of an embossed carrier tape which used a fixed interval and established a sprocket engagement hole in a flange in alignment with a sequence of said pocket while carrying out punching work, projecting at the pars basilaris ossis occipitalis of each of said pocket and providing a hole.

In transfer distance which carries out an intermittent transfer by a fixed quantity of transfer length, said sheet. The heated work of said sheet which carried out preheating of said sheet before embossing molding, and carried out temperature up through a preheating means which carries out temperature up, and said preheating means is carried out. A heating unit which has a radiant heat cutoff means which sprays air on a heated work means which carries out temperature up to a temperature higher than preheating, and said sheet, and intercepts radiant heat from said both heating methods to a sheet.

A molding section which molds two or more pockets which perform embossing molding by compressed-air molding for said every transfer length to a sheet transported through said heating unit, make it specified shape, respectively, and are continuously located in a line along with a sheet longitudinal direction.

A punch part which has a positioning means which positions a sheet on the basis of an end of an embossing molding portion in a sheet transported through said molding section.

[Claim 2]The embossed carrier tape making machine according to claim 1 having a cooling method which gives partial cooling to an embossing object domain in the above-mentioned molding section.

[Translation done.]